PATENT ABSTRACTS OF JAPAN

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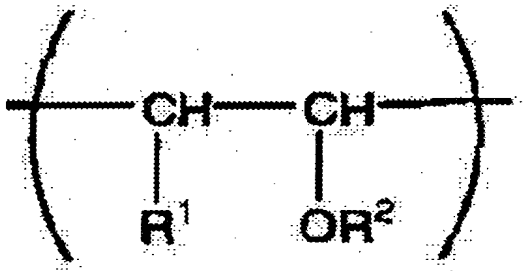
(54) SOFTENING AGENT

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a softening agent used for thermoplastic resins and imparting flexibility, impact resistance.
SOLUTION: The following inventions (1) to (3) are provided. (1). This thermoplastic resin-softening agent containing polyvinyl ether. (2). The thermoplastic resin-softening agent, wherein the polyvinyl ether is a polyvinyl ether having structural units represented by the general formula (I) (R1 is H or a lower alkyl; R2 is a substituted or non-substituted lower alkyl, a substituted or non-substituted cycloalkyl, a substituted or non-substituted aryl, or a substituted or non-substituted aralkyl). (3). The thermoplastic resin-softening agent, wherein the weight-average mol.wt. of the polyvinyl ether is 1,000 to 3,000,000.



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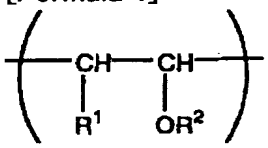
CLAIMS

[Claim(s)]
[Claim 1] The elasticity-ized agent of the thermoplastics containing polyvinyl ether.
[Claim 2] Polyvinyl ether is a general formula (I).
[Formula 1]



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It is the elasticity-ized agent according to claim 1 which is polyvinyl ether which has the structural unit expressed with (R1 expresses a hydrogen atom or low-grade alkyl among a formula, and R2 expresses a permutation, unsubstituted low-grade alkyl and a permutation or unsubstituted cycloalkyl, a permutation, unsubstituted aryl, a permutation, or an unsubstituted aralkyl).
[Claim 3] The elasticity-ized agent according to claim 1 or 2 whose weight average molecular weight of polyvinyl ether is 1,000-3,000,000.
[Claim 4] JIS of thermoplastics K Elasticity-ized agent according to claim 1 to 3 whose hauling elastic modulus based on 7113 is 150 or more (23 degrees C) MPas.
[Claim 5] The elasticity-ized agent according to claim 1 to 4 whose weight average molecular weight of thermoplastics is 3,000-3,000,000.
[Claim 6] The elasticity-ized agent according to claim 1 to 5 whose molecular weight distribution [Mw (weight average molecular weight)/Mn (number average molecular weight)] of polyvinyl ether are 1.5 or less.
[Claim 7] The elasticity-ized approach of the thermoplastics characterized by mixing thermoplastics and polyvinyl ether.
[Claim 8] The constituent containing polyvinyl ether and polyester resin.
[Claim 9] The constituent according to claim 8 whose polyester resin is a polyhydroxy carboxylic acid.
[Claim 10] The constituent containing polyvinyl ether and polystyrene resin.
[Claim 11] The constituent containing polyvinyl ether and polycarbonate resin.

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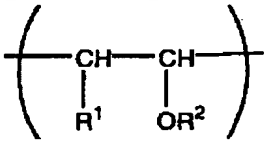
DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the elasticity-ized agent of thermoplastics which gives flexibility, shock resistance, etc. to thermoplastics.
[0002]
[Description of the Prior Art] Conventionally, it considers as the approach of making thermoplastics elasticity-izing, and the approach of blending a plasticizer and elasticity resin to thermoplastics is learned. For example, in order to make JP,6-306264,A elasticity-ize the polylactic acid inferior to flexibility and shock resistance, adding the annular oligomer of a lactic acid to the copolymer of polylactic acid or a lactic acid, and other hydroxycarboxylic acid as a plasticizer is indicated.
[0003] Moreover, in order to make a U.S. Pat. No. 3636956 number elasticity-ize L-lactide / D, and L-lactide copolymer, adding triacetin to this copolymer is indicated by it as a plasticizer. However, the constituent obtained by which the aforementioned approach also has the trouble [fogging / bleeding,] that a lifting, a cone, thermal resistance, and shock resistance are not enough.
[0004]
[Problem(s) to be Solved by the Invention] The purpose of this invention is to offer the elasticity-ized agent of the thermoplastics which gives flexibility, shock resistance, etc. to thermoplastics.
[0005]
[Means for Solving the Problem] This invention offers the following [1]- [11].
[1] The elasticity-ized agent of the thermoplastics containing polyvinyl ether.
[2] Polyvinyl ether is a general formula (I).
[0006]
[Formula 2]



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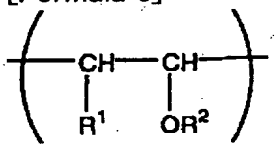
[0007] It is the elasticity-ized agent given in [1] which is polyvinyl ether which has the structural unit expressed with (R1 expresses a hydrogen atom or low-grade alkyl among a formula, and R2 expresses a permutation, unsubstituted low-grade alkyl and a permutation or unsubstituted cycloalkyl, a permutation, unsubstituted aryl, a permutation, or an unsubstituted aralkyl).
[3] [1] whose weight average molecular weight of polyvinyl ether is 1,000-3,000,000, or an elasticity-ized agent given in [2].
[4] JIS of thermoplastics K Elasticity-ized agent given in either of [1]- [3] whose hauling elastics modulus based on 7113 are 150 or more (23 degrees C) MPas.

[5] An elasticity-ized agent given in either of [1]- [4] whose weight average molecular weight of thermoplastics is 3,000-3,000,000.
[6] An elasticity-ized agent given in either of [1]- [5] whose molecular weight distributions [Mw (weight average molecular weight)/Mn (number average molecular weight)] of polyvinyl ether are 1.5 or less.
[7] The elasticity-ized approach of the thermoplastics characterized by mixing thermoplastics and polyvinyl ether.
[8] The constituent containing polyvinyl ether and polyester resin.
[9] The constituent given in [8] given polyester resin is a polyhydroxy carboxylic acid.
[10] The constituent containing polyvinyl ether and polystyrene resin.
[11] The constituent containing polyvinyl ether and polycarbonate resin.
[0008]
[Embodiment of the Invention] In the definition of each radical in a general formula (I), as low-grade alkyl, the straight chain of carbon numbers 1-8 or the alkyl of the letter of branching is raised, and methyl, ethyl, propyl, isopropyl, butyl, sec-butyl, tert-butyl, isobutyl, pentyl, isopentyl, neopentyl one, hexyl, heptyl, octyl, etc. are raised as the example, for example.
[0009] As cycloalkyl, the cycloalkyl of carbon numbers 3-10 is raised, and cyclo propyl, cyclo butyl, cyclopentyl, cyclohexyl, cycloheptyl one, cyclo octyl, cyclo nonyl, cyclodecyl, etc. are raised as the example, for example. As aryl, the aryl of carbon numbers 6-14 is raised, and phenyl, naphthyl, anthryl, etc. are raised as the example, for example.
[0010] As an aralkyl, the aralkyl of carbon numbers 7-15 is raised, and benzyl, phenethyl, naphthyl methyl, naphthyl ethyl, benzhydryl, trityl, etc. are raised as the example, for example. As a substituent of permutation low-grade alkyl and permutation cycloalkyl, a low-grade alkoxy ** halogen atom etc. is raised, for example.
[0011] As a substituent of permutation aryl and a permutation aralkyl, a low-grade alkyl and low-grade alkoxy ** halogen atom etc. is raised, for example. In the definition of a substituent, the same thing as the above is raised as low-grade alkyl and a low-grade alkyl part of low-grade ARUKOKISHI, and each atom of a fluorine, chlorine, a bromine, and iodine is raised as a halogen atom.
(1) Although not limited especially as polyvinyl ether about polyvinyl ether, it is a general formula (I).
[0012]
[Formula 3]



(I)

[0013] The polyvinyl ether which has the structural unit expressed with (the inside of a formula, and R1 and R2 are synonymous with the above respectively) is desirable, and that whose R2 is a permutation or unsubstituted low-grade alkyl especially is used more preferably. Polyvinyl ether can be manufactured when cationic polymerization etc. carries out a corresponding monomer by the well-known approach [the laboratory procedure of composition and the reaction of a macromolecule (1), the edited by Society of Polymer Science, Japan, 242 - 276 pages, KYORITSU SHUPPAN, 1995, and macromolecule composition, 195 - 207 pages, Kagaku-Dojin, 1972], etc.
[0014] Polyvinyl ether may be a homopolymer or may be a copolymer. Although especially the weight average molecular weight of polyvinyl ether is not limited, it is desirable that it is 1,000-3,000,000, and it is more desirable that it is 3,000-1,000,000.
[0015] Moreover, although especially the molecular weight distribution [Mw (weight average molecular weight)/Mn (number average molecular weight)] of polyvinyl ether are not limited, it is desirable that it is 1.5 or less, and it is more desirable that it is 1.0-1.5.

(2) It is JIS although not limited especially as thermoplastics about the thermoplastics with which the elasticity-ized agent of this invention is used. K That whose hauling elastic modulus based on 7113 is 150 or more (23 degrees C) MPas is desirable, and what is 150-600MPa (23 degrees C) is more desirable.

[0016] As an example of thermoplastics, polyolefin resin, such as high density polyethylene and polypropylene, Polystyrene resin, such as polystyrene, AS (acrylonitrile-styrene) resin, and ABS (acrylonitrile-styrene butadiene rubber) resin, Pori acrylic resin, such as polymethylacrylate, polyethylene terephthalate, Polyester resin, such as polybutylene terephthalate and a polyhydroxy carboxylic acid, Polycarbonate resin, polyamide resin, polyacetal resin, etc. are raised, and polyolefin resin, polystyrene resin, polyester resin, or polycarbonate resin is desirable especially. Moreover, in polyester resin, a polyhydroxy carboxylic acid is desirable.

[0017] As a polyhydroxy carboxylic acid, the copolymer of polylactic acid or a lactic acid, and other hydroxycarboxylic acid etc. is desirable, for example. In the copolymer of a lactic acid and other hydroxycarboxylic acid, it is desirable that a lactic acid is included 50% of the weight or more in all the monomers of a raw material, and it is more desirable to contain 90% of the weight or more.

[0018] Although especially the weight average molecular weight of thermoplastics is not limited, it is desirable that it is 3,000-3,000,000, and it is more desirable that it is 5,000-1,000,000. Although thermoplastics may be manufactured by well-known approaches (the volume for organic chemistry handbook Society of Synthetic Organic Chemistry, Japan, 494-538 pages, Gihodo Shuppan, July 10, Showa 43 issue, etc.), purchasing as a commercial item is also possible. Especially, the detail is explained below about an example of the manufacturing method of a polyhydroxy carboxylic acid.

[0019] As hydroxycarboxylic acid which is the raw material of a polyhydroxy carboxylic acid, a lactic acid, a glycolic acid, 3-hydroxybutyric acid, 4-hydroxybutyrate, a 4-hydroxy valeric acid, a 5-hydroxy valeric acid, a 6-hydroxy caproic acid, etc. are raised, for example. The hydroxycarboxylic acid which is the raw material of a polyhydroxy carboxylic acid may be L bodies, D object, or DL object.

[0020] A polyhydroxy carboxylic acid can manufacture hydroxycarboxylic acid or a corresponding lactide dehydration condensation or by carrying out ring opening polymerization according to a well-known approach (JP,6-65369,A, JP,10-168167,A, WO 97/08220, WO97 / 12926 grades). 130 degrees C or more of melting points of the polyhydroxy carboxylic acid obtained are 130-250 degrees C more preferably.

[0021] (3) About the elasticity-ized agent of this invention, in the elasticity-ized agent of this invention, as for polyvinyl ether, it is desirable to contain 50% of the weight or more to total weight, and it is more desirable to contain 70% of the weight or more. Although the elasticity-ized agent of this invention may contain a pigment, an electro-conductivity applying agent, an antistatic agent, a color, an antioxidant, a photodegradation inhibitor, lubricant, an antifungal agent, etc. if needed and especially these amount used is not limited, it is desirable that it is 0.01 - 5.0 % of the weight to polyvinyl ether.

[0022] As for the elasticity-ized agent of this invention, it is desirable to be used to thermoplastics, so that polyvinyl ether may become 1 - 50% of the weight, and it is more desirable to be used so that it may become 5 - 30% of the weight. although especially the operation of the elasticity-ized agent of this invention is not what is limited — a well-known approach (a practice polymer alloy —) According to 21 pages, the company of the AGUNE ** style, October 20, 1993 issue, etc., the elasticity-ized agent of this invention is mixable to thermoplastics. Specifically After adding the elasticity-ized agent of this invention to thermoplastics, the approach of mixing by heating kneading (preferably 150-250 degrees C) with an opening roll, a direct-vent-system kneading machine, an extrusion type kneading machine, etc. is desirable. In this invention, an elasticity-ized agent may be added to thermoplastics, it may be mixed, an elasticity-ized agent may be made to add and mix thermoplastics, and especially the sequence of addition of an elasticity-ized agent and thermoplastics is not limited.

[0023] According to well-known approaches (a guide to plastics fabrication, 59-78 pages, Nikkan Kogyo Shimbun, March 1, Showa 57 issue, etc.), the constituent containing the elasticity-ized

agent and thermoplastics of this invention can be melted to thermoforming processing or a solvent, and can be used for the application of a sheet, a film, a plate, tube-like mold goods, the plastics for a package, a hose, a wire covering, a food tray, a food container, an injection-molded product, etc. spreading or by carrying out a laminating.
[0024] The constituent containing the elasticity-ized agent and thermoplastics of this invention is excellent in flexibility, shock resistance, thermal resistance, transparency, etc., and bleeding and fogging hardly happen.
(4) The elasticity-ized approach of this invention can be enforced according to the operation of the elasticity-ized agent of this invention explained above etc. about the elasticity-ized approach of this invention. In the elasticity-ized approach of this invention, thermoplastics may be made to add and mix polyvinyl ether, polyvinyl ether may be made to add and mix thermoplastics, and especially the sequence of addition of polyvinyl ether and thermoplastics is not limited.
[0025] (5) Additives, such as a pigment, an electro-conductivity applying agent, an antistatic agent, a color, an antioxidant, a photodegradation inhibitor, lubricant, and an antifungal agent, can be added to the constituent containing the polyvinyl ether, the polystyrene resin, polyester resin, or polycarbonate resin of this invention if needed about the constituent containing the polyvinyl ether, the polystyrene resin, polyester resin, or polycarbonate resin of this invention. Although especially the addition is not limited, it is desirable that it is 0.01 - 5.0 % of the weight to these constituent all weight.
[0026] The constituent containing the constituent containing the polyvinyl ether, the polystyrene resin, polyester resin, or polycarbonate resin of this invention According to well-known approaches (a guide to plastics fabrication, 59-78 pages, Nikkan Kogyo Shimbun, March 1, Showa 57 issue, etc.), it melts to thermoforming processing or a solvent. Spreading or by carrying out a laminating It can be used for the application of a sheet, a film, a plate, tube-like mold goods, the plastics for a package, a hose, a wire covering, a food tray, a food container, an injection-molded product, etc.
[0027] The constituent containing the polyvinyl ether, the polystyrene resin, polyester resin, or polycarbonate resin of this invention is excellent in flexibility, shock resistance, thermal resistance, transparency, etc., and bleeding and fogging hardly happen.
[0028]
[Example] Measurement of the weight average molecular weight of the polylactic acid obtained in the example 1 of reference was measured by the following approach with gel permeation chromatography.
The detection approach: RI (differential refractive index) and UV (ultraviolet absorption)
Column: TOSOH G-5000, TOSOH G-3000 and TOSOHG-1000 (all are the TOSOH CORP. make) were connected with the serial.
column oven: — 40-degree-C expansion solvent: — chloroform internal standard matter: — the weight average molecular weight, number average molecular weight, and molecular weight distribution of polyvinyl ether which were acquired in the examples 2 and 3 of polystyrene reference were measured by the following approach with gel permeation chromatography.
detection approach: — RI and UV column: — TSK gel Super HM-M 2 and TSK gel Super HM-H (all are the TOSOH CORP. make) was connected with the serial.
column oven : 40-degree-C expansion solvent: — tetrahydrofuran internal standard matter: — polystyrene [0029] The example 1 of reference: After adding the 1010.0 g L-lactic acid water solution (the Wako Pure Chem Industries make) of the 90 % of the weight concentration of composition of polylactic acid in the reaction container equipped with churning equipment, a RIBIHHI cooling pipe, and nitrogen installation tubing and performing a nitrogen purge, the temperature up was carried out making it reduced pressure gradually, and it could be 150 degrees C. Furthermore, finally it was made reduced pressure to 133Pa. 525.2g (52% of recovery) of mixture which uses as a principal component the lactic acid and lactic-acid oligomer which are distilled to the receiver cooled by iced water was obtained.
[0030] The mixture which uses as a principal component the lactic acid and lactic-acid oligomer which were obtained was melted to the acetone, and the acid number was measured.

Consequently, the polymerization degree of the lactic acid in this mixture was about 1.20. 500.0g of mixture which uses this lactic acid and lactic-acid oligomer as a principal component was stirred at 140 degrees C under the nitrogen air current for 5 hours, and lactic-acid oligomer 417.0g was obtained. Polymerization degree was 3.41, when acid-number measurement was performed like the above and polymerization degree was measured.

[0031] After having added synthetic-aluminum-silicate [Tomita Phamarceutical Co., Ltd.] 8g to this oligomer 400g, having carried out the temperature up to 200 degrees C, decompressing to 2220Pa gradually over 30 minutes and agitating at 200**5 degrees C for 1 hour, it decompressed to 133Pa gradually and agitated at 200**5 degrees C for 9 hours. It cooled to the room temperature and about 200g of polylactic acid of the solidified opalescence was obtained. The weight average molecular weight of the obtained polylactic acid was 83,000.

[0032] The example 2 of reference: Dichloromethane solution 6L containing isobutyl vinyl ether 5mol (500.8g) and iso butoxy ethyl chloride 5mmol was prepared among the reaction container which followed the synthetic three-way cock of poly isobutyl vinyl ether. It added at -15 degree C and 500ml of dichloromethane solutions which contain tin tetrachloride 25mmol and tetra-normal butyl ammoniumchloride 40mmol in this monomer solution was fully agitated. Methanol 2L was added in this polymerization solution, and it was made to suspend a polymerization after [of churning] 50 minutes. This solution was diluted with the hexane, the solvent was distilled off after washing in order of a hydrochloric-acid water solution, a sodium-hydroxide water solution, and water, and poly isobutyl vinyl ether about 490g was collected. The conversion of the isobutyl vinyl ether at this time was 98%, and the weight average molecular weight (Mw) of the obtained poly isobutyl vinyl ether was [100,000 and molecular-weight-distribution Mw/Mn of 140,000 and number average molecular weight (Mn)] 1.40.

The example 3 of reference: Except having changed the synthetic isobutyl vinyl ether of poly ethyl vinyl ether into ethyl-vinyl-ether 6.93mol (500g), the same actuation as the example 2 of reference was carried out, and poly ethyl-vinyl-ether about 480g was collected.

[0033] Poly isobutyl vinyl ether 9.0g obtained in 51.0g of polylactic acid obtained in the example 1 of example 1 reference and the example 2 of reference was kneaded and compound-ized at 190 degrees C using the lab PURASUTO mill made from an Oriental energy machine. The sheet with a thickness of 2mm was obtained for this at 190 degrees C using the heat press. The obtained sheet was transparent and colorless.

[0034] The sheet with a thickness of 2mm was obtained by the same actuation as an example 1 using poly ethyl-vinyl-ether 9.0g obtained in 51.0g of polylactic acid obtained in the example 1 of example 2 reference, and the example 3 of reference. The obtained sheet was transparent and colorless.

[0035] Poly isobutyl vinyl ether 9.0g obtained in 51.0g (Japan Polychem MA03) of polypropylene resin and the example 2 of reference of example 3 marketing was kneaded and compound-ized at 220 degrees C using the lab PURASUTO mill made from an Oriental energy machine. The sheet with a thickness of 2mm was obtained for this at 230 degrees C using the heat press.

[0036] The sheet with a thickness of 2mm was obtained by the same actuation as an example 3 using poly isobutyl vinyl ether 9.0g obtained in 51.0g (A- and - em styrene company make HH105) of polystyrene resin and the example 2 of reference of example 4 marketing except making kneading temperature into 200 degrees C.

[0037] The sheet with a thickness of 2mm was obtained by the same actuation as an example 3 except making kneading temperature and heat press temperature into 280 degrees C using poly isobutyl vinyl ether 9.0g obtained in 51.0g (Mitsubishi engineering plastics company make S2000) of polycarbonate resin and the example 2 of reference of example 5 marketing.

[0038] The sheet with a thickness of 2mm was obtained by the same actuation as an example 3 using poly ethyl-vinyl-ether 9.0g obtained in 51.0g (Japan Polychem MA03) of polypropylene resin and the example 3 of reference of example 6 marketing.

[0039] The sheet with a thickness of 2mm was obtained by the same actuation as an example 4 using poly ethyl-vinyl-ether 9.0g obtained in 51.0g (A- and - em styrene company make HH105) of polystyrene resin and the example 3 of reference of example 7 marketing.

[0040] The sheet with a thickness of 2mm was obtained by the same heat press forming as an

example 1 using 60.0g of polylactic acid obtained in the example 1 of example of comparison 1 reference. The obtained sheet was transparent and colorless.
[0041] The sheet with a thickness of 2mm was obtained with 230-degree-C heat press using 60g (Japan Polychem MA03) of polypropylene resin of example of comparison 2 marketing.
[0042] Using 60g (A- and - em styrene company make HH105) of polystyrene resin of example of comparison 3 marketing, it was alike with 230-degree-C heat press, and the sheet with a thickness of 2mm was obtained more.
[0043] The sheet with a thickness of 2mm was obtained with 280-degree-C heat press using 60g (Mitsubishi engineering plastics company make S2000) of polycarbonate resin of example of comparison 4 marketing.
[0044] 51.0g (Japan Polychem MA03) of polypropylene resin of example of comparison 5 marketing, and Hy Buller 7125[— : by Kuraray Co., Ltd. — the sheet with a thickness of 2mm was obtained by the same actuation as an example 1 using styrene-isoprene system thermoplastic-elastomer]9.0g.
[0045] 51.0g (A- and - em styrene company make HH105) of polystyrene resin of example of comparison 6 marketing, and Hy Buller 7125[— : by Kuraray Co., Ltd. — the sheet with a thickness of 2mm was obtained by the same actuation as an example 1 using styrene-isoprene system thermoplastic-elastomer]9.0g.
[0046] polycarbonate resin (Mitsubishi engineering plastics company make S2000) of example of comparison 7 marketing 51.0g and Hy Buller 7125[— : by Kuraray Co., Ltd. — the sheet with a thickness of 2mm was obtained by the same actuation as an example 5 using styrene-isoprene system thermoplastic-elastomer]9.0g.
[0047] The sheet obtained in example of trial 1 examples 1 and 2 and the example 1 of a comparison is used, and it is JIS. K The hauling trial was performed based on 7113. a hauling trial — the Shimadzu make — it carried out using autograph AG5KN and the test piece configuration set the No. 2 test piece and the hauling rate to 50mm per for 1 minute. A result is shown in Table 1.
[0048]
[Table 1]
表1

	実施例1	実施例2	比較例1
引っ張り降伏強度 (MPa)	47	48	69
引っ張り伸び (%)	21	21	3.5

[0049] It can be said that the sheet obtained in the examples 1 and 2 is excellent, and excellent flexibility and in respect of shock resistance in respect of hauling yield strength and hauling elongation as compared with the sheet obtained in the example 1 of a comparison.
[0050] The sheet obtained in the example of trial 2 examples 1 and 2 was left for one month in the 50-degree C hot blast circuit system electric furnace, and generating and weight reduction of a bleeding object in each sheet of one month after were investigated. Consequently, generating and weight reduction of a bleeding object were accepted in neither of the sheet obtained in the examples 1 and 2. That is, the sheet obtained in the examples 1 and 2 has the outstanding quality from which bleeding and fogging do not happen in prolonged use.
[0051] The following evaluations were performed about the sheet obtained in example of trial 3 examples 3-7, and the examples 2-7 of a comparison.
Measurement of Rockwell hardness: It is JIS about the Rockwell hardness of a sheet. K It measured according to 7202. an altimeter — the product made from AKASHI — R scale performed using ABK-8.
Hauling trial: It carried out like the example 1 of a trial. Only about the sheet obtained in the examples 3-7, hauling yield strength and hauling breaking strength were measured.

[0052] This result is shown in Tables 2 and 3. Moreover, each notation of front Naka expresses following semantics.
PP: Commercial polypropylene resin (Japan Polychem MA03)
PS: Commercial polystyrene resin (A- and - em styrene company make HH105)
PC: Commercial polycarbonate resin (Mitsubishi engineering plastics company make S2000)
poly ethyl-vinyl-ether high BURA: obtained in the example 3 of poly isobutyl vinyl ether
PEVE:reference acquired in the example 2 of PIBVE:reference — Hy Buller 7125[— : by Kuraray Co., Ltd. — styrene-isoprene system thermoplastic-elastomer]
Moreover, a combination weight ratio expresses the weight ratio of thermoplastics / elasticity-ized agent.
[0053]
[Table 2]
表2

	実施例 3	実施例 4	実施例 5	実施例 6	実施例 7
熱可塑性樹脂	PP	PS	PC	PP	PS
軟質化剤	PIBVE	PIBVE	PIBVE	PEVE	PEVE
配合重量比	85/15	85/15	85/15	85/15	85/15
ロックウエル硬度 (HRR)	75	96	80	70	91
引っ張り降伏強度 (MPa)	24	—	38	25	—
引っ張り破断強度 (MPa)	14	30	37	14	30
引っ張り伸び (%)	112	2	44	161	2

[0054]
[Table 3]
表3

	比較例 2	比較例 3	比較例 4	比較例 5	比較例 6	比較例 7
熱可塑性樹脂	PP	PS	PC	PP	PS	PC
軟質化剤	—	—	—	ﾊｲﾌﾞﾗｰ	ﾊｲﾌﾞﾗｰ	ﾊｲﾌﾞﾗｰ
配合重量比	100/0	100/0	100/0	85/15	85/15	85/15
ロックウエル硬度 (HRR)	93	118	115	78	98	85
引っ張り伸び (%)	3	1	15	3	1	15

[0055] It can be said that the sheet obtained in the examples 3-7 is excellent in respect of Rockwell hardness and hauling elongation, and excellent flexibility and in respect of shock resistance as compared with the sheet obtained in the examples 2-7 of a comparison.
[0056] The sheet obtained in the example of trial 4 examples 3-7 was left for one month in the 50-degree C hot blast circuit system electric furnace, and generating and weight reduction of a bleeding object in each sheet of one month after were investigated. Consequently, generating and weight reduction of a bleeding object were accepted in neither of the sheet obtained in the examples 3-7. That is, the sheet obtained in the examples 3-7 has the outstanding quality from which bleeding and fogging do not happen in prolonged use.
[0057]
[Effect of the Invention] The elasticity-ized agent of the thermoplastics which contains the polyvinyl ether which gives flexibility, shock resistance, etc. to thermoplastics by this invention is offered.

[Translation done.]